

Application No. 10/553,689
Amendment Dated: March 3, 2008
Reply to the Office Action of December 3, 2007

REMARKS

Reconsideration of the application is respectfully requested.

Claims 1-21 are pending.

Claim Rejections under 35 USC §103(a)

Claims 1-21 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,290,745 to Jorgensen et al. (hereinafter Jorgensen-745) in view of U.S. Patent No. 6,617,405 to Jorgensen (hereinafter Jorgensen-405.) Applicants respectfully disagree.

Applicants recite *inter-alia* a gas phase olefin polymerization process comprising the step of partially pre-activating the catalyst precursor by contacting the recited slurry with one or more Lewis Acids employing one or more in-line static mixers, wherein the molar ratio of the Lewis Acid to the electron donor in the catalyst precursor is about 0.1:1 to about 0.3:1; and transferring the partially pre-activated catalyst precursor under plug-flow conditions into a gas phase, olefin polymerization reactor and adding an additional amount of the activator to the reactor to produce a homogeneous activated catalyst mixture, wherein the catalyst is partially pre-activated for a short residence time to minimize deactivation of the catalyst of about 1 minute to about 6 hours prior to the transferring step.

In contrast, Jorgensen-745 is generally directed to a catalyst system of the Ziegler-Natta type suitable for producing ethylene copolymers having a reduced hexane extractable content. Example 1 at Col. 10, line 39 discloses a process wherein the partial activation of the catalyst is conducted batch-wise in a 400 liter vessel. Jorgensen-745 discloses a process wherein the first activator is added to the 400 liter vessel and then stirred for one hour, followed by addition of the second activator which is again stirred for another two hours to produce a slurry is formed containing approximately 28 weight percent of the solid catalyst component.

Jorgensen-745 teaches away from Applicants' presently claimed invention, in that it recites the step of partially activating the catalyst while transferring the partially pre-activated catalyst precursor under plug-flow conditions into a gas phase, olefin polymerization reactor, wherein the catalyst is partially pre-activated for a short residence time to minimize deactivation of the catalyst of about 1 minute to about 6 hours prior to the transferring step.

Application No. 10/553,689
Amendment Dated: March 3, 2008
Reply to the Office Action of December 3, 2007

Furthermore, Jorgensen-745 is directed to producing low-density polyethylene copolymers (i.e., density of 0.918 g/cm^3 .) Low density polymerization processes are known by one of skill in the art not to produce an appreciable amount of fines. In contrast, Applicants have unexpectedly discovered a process in which a high density product may be produced with less fines than would be produced with other processes known in the art for producing such high density copolymers, as Applicants disclose in Table 1 and discuss in numbered paragraph [0112] of U.S. Patent Publication No. 2006/0287445 of the instant patent application. Accordingly, Jorgensen-745 fails to disclose or suggest all the limitations recited in Applicants' presently claimed invention.

As noted previously, Jorgensen-405 discloses a process wherein the essentially complete activation of the precursor is carried out prior to introduction of the precursor into the reactor.

In Examples 1-4, Jorgensen-405 discloses a catalyst precursor preactivated using about 0.2 mole of a first activator and 0.45 moles of a second activator for a total of 0.65 moles activator per mole of electron donor (see Col. 12, lines 1-13, Jorgensen-405.). Jorgensen-405 is thus outside of Applicants recited range of 0.1:1 to 0.3:1.

Jorgensen-405 further discloses "[a]dditional activator is fed to provide for sufficient activation of the catalyst plus a small additional amount to scavenge impurities in the polymerization reactor. The total amount of the additional 'topping off' activator can be about 0.1 to about 75 percent by mol of the total amount of the activator used for the activation of the precursor. Addition of all the activator to the catalyst precursor eliminates mass transfer problems, which would prevent the activator from reaching the catalyst precursor if separate addition to the reactor was practiced." (see Col. 7, lines 17 to 26)

Accordingly, Jorgensen-405 is directed to essentially complete activation followed by topping off of the reactor to ensure complete activation. This is in direct contrast to Applicants' presently claimed invention, wherein the catalyst precursor is only partially activated to between 0.1 to 0.3 moles of activator to electron donor, and then fully activated in the reactor with the addition of between 2 moles to 50 moles of activator added per mole of electron donor, which is exactly the converse of the teachings of Jorgensen-405. As such, Jorgensen-405 fails to cure the defects in Jorgensen-745. In fact, Jorgensen-405 actually teaches away from Applicants' presently claimed invention.

Application No. 10/553,689
Amendment Dated: March 3, 2008
Reply to the Office Action of December 3, 2007

Claim Rejections under 35 USC §102 (b)

Claims 1-5, 8-18, and 21 have been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,187,866 to Jorgensen et al. (hereinafter Jorgensen-866.) Claims 6, 7, 19, and 20 are likewise rejected under 35 U.S.C. §103(a) as being unpatentable over Jorgensen-866 for the same rationale as cited in the rejections under 35 U.S.C. §103(a) as being unpatentable over Jorgensen-745 in view of Jorgensen-405. Applicants respectfully disagree.

Jorgensen-866 is generally directed to a process for the in situ blending of polymers comprising contacting ethylene and one or more comonomers in two or more fluidized bed reactors with a catalyst system comprising (i) a magnesium/titanium based precursor containing an electron donor and (ii) a hydrocarbyl aluminum cocatalyst, the improvement comprising (A) increasing or decreasing the melt flow ratio and/or molecular weight of the blend by, respectively, decreasing or increasing the mole ratio of a precursor activator compound to the electron donor or (B) increasing or decreasing the bulk density of the blend by, respectively, increasing or decreasing the mole ratio of a precursor activator compound to the electron donor, both (A) and (B) subject to defined provisos including partial pre-activation of the precursor.

As Jorgensen-866 discloses, for example, at Col. 13, lines 31-49, to partially activate the catalyst slurry, a 50 weight percent solution of tri-n-hexylaluminum (TnHA) in mineral oil is added as the slurry is being pumped to the reactor. This mixture is held in a residence time vessel for roughly 1 to 4 hours, depending on the absolute feed rate of the catalyst. The TnHA solution is employed in an amount sufficient to provide 0.25 mole of TnHA per mole of THF in the catalyst. Sequentially, then a 30 weight percent solution of diethylaluminum chloride (DEAC) in mineral oil is added and the mixture is held in another residence time vessel for roughly 1 to 4 hours, again depending on the absolute feed rate of the catalyst. The DEAC is employed in an amount sufficient to provide 0.50 mole of DEAC per mole of THF in the catalyst. The mole ratio of total activator (TnHA plus DEAC) to THF is 0.75:1. The partially activated catalyst then exits the second residence time vessel and goes directly into the polymerization reactor where it is fully activated with the final amount of cocatalyst. Accordingly, Jorgensen-866 fails to disclose or suggest Applicants' recited step of partially pre-activating the catalyst precursor by contacting the slurry with one or more Lewis Acids

Application No. 10/553,689
Amendment Dated: March 3, 2008
Reply to the Office Action of December 3, 2007

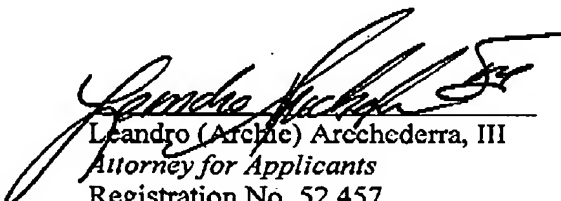
employing one or more in-line static mixers, and transferring the partially pre-activated catalyst precursor under plug-flow conditions into a gas phase, olefin polymerization reactor and adding an additional amount of the activator to the reactor to produce a homogeneous activated catalyst mixture. In addition, Jorgensen-866 is directed to producing low density polymers, which do not produce an appreciable amount of fines, as discussed previously regarding Jorgensen-745.

Since Jorgensen-866 fails to disclose or suggest all of Applicants' recited limitations, Jorgensen-866 cannot be found to anticipate nor obviate Applicants' presently claimed invention.

Applicants respectfully request that all rejections be withdrawn and solicit a prompt notice of allowability. In the alternative, Applicants invite the Office to telephone the undersigned attorney if there are any other issues outstanding which have not been presented to the Office's satisfaction.

Respectfully submitted,

March 3, 2008
Date


Leandro (Archie) Arechederra, III
Attorney for Applicants
Registration No. 52,457

Univation Technologies, LLC
5555 San Felipe, Suite 1950
Houston, Texas 77056-2723
Phone: 713-892-3729
Fax: 713-892-3687